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# What—Me Do Research?

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A flight surgeon assigned with the Air Force Research Laboratory (AFRL) wears several hats, not unlike working in any flight surgeon's office. These include but are not limited to occupational medicine, direct patient care, and participation in hazardous duty. Other functions are unique to the research environment, such as human research subject protection and research study design. Some of AFRL's collaborators include Georgia Tech, Texas A&M, Oxford University, University of Texas at San Antonio, the University of Cincinnati, the University of Montana, Allegheny-Singer Research Institute, NASA, the United States Army Research Institute of Environmental Medicine, and the Naval Aerospace Medical Research Laboratory. Prior to serving as the second AF Surgeon General, Maj Gen Harry G. Armstrong founded the Aero-Medical Laboratory at Wright Field in 1935 and established the Research Section of USAFSAM in 1942.

## Occupational Medicine

As a physician, medical care is provided for all operational personnel, in this case, human research subjects. This involves setting medical standards for participation in a variety of experiments. Questions to be answered include what medical conditions and treatments make it unsafe to participate or may confound the data collected. Fitness for duty exams and test results interpretation are performed before some experiments. Post-exposure exams are necessary after all altitude chamber flights and some centrifuge runs. OSHA requires that employee exposure records be maintained for any exposure to toxic substances or harmful physical agents. This includes "physical stress defined as noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo- or hyperbaric pressure, etc." These records are separate from Air Force medical records, though some information may be eventually transferred to the medical record.

## Direct Patient Care

Any human research subject injured or ill during an experiment requires appropriate medical care. Medical treatment protocols are useful for fatigue or bed rest studies where subjects have been confined for up to thirty days. Providing on-site medical care may allow a subject to continue participation and avoid loss of income by the subject and loss of research data for the investigator. After the experimental exposure is complete, on-site medical care minimizes the impact on the local flight surgeon's office, freeing limited medical resources for other patients. Musculoskeletal and neurological injuries are the most common problems with centrifuge exposures. Altitude research allowed the opportunity to manage over 150 cases of decompression sickness (DCS), the majority of which did not require Hyperbaric Medicine evaluation. Fatigue countermeasures research can elicit a variety of adverse drug reactions and the computer based tests used even produced repetitive strain disorders during a ten day session.

## Hazardous Duty

In addition to the required minimum four hours flying per month, human research necessitates that a flight surgeon be prepared to enter a research altitude chamber if needed to assist with returning a subject to ground level. Some of the altitude chamber flights involve testing of new life support equipment.

Malfunctions do occur and a subject can experience a variety of consequences other than DCS. Trapped gas symptoms can develop after a rapid decompression or difficulty ventilating via a Valsalva maneuver has required the use of a Politzer bag at altitude to allow descent to ground level. For those of robust constitution, participation as a centrifuge test subject affords the chance for more high G exposures than any person can desire in one lifetime. If you have not worn the Advanced Tactical Anti-G Suit (ATAGS), I highly suggest that you take advantage of any opportunity to do so. It will make a 9 G monster out of most anyone. As one of the few military personnel assigned to AFRL, a flight surgeon brings an operational perspective unmatched by most other unit personnel.

## Human Research Subject Protection

Separate from occupational medicine, the protection of human participants is the most important function of a flight surgeon with AFRL. The Belmont Report defines the ethical principles essential to biomedical research involving human participants. The core principles are respect for persons, beneficence, and justice. The flight surgeon plays a critical role in the second principle—that of protecting them from harm and maximizing potential benefit while minimizing risk. Every research study must be approved by an institutional review board (IRB). The flight surgeon serves as the medical monitor representative of the IRB to ensure this second principle is upheld. Specific training is required to perform this duty. The medical monitor must place participant safety above research outcomes at all times. It is not the role of the medical monitor to critique the scientific merit of the experiment. That responsibility is held by the investigating organization and the IRB.

## Research Study Design

The AFRL Human Effectiveness Directorate conducts human use research. The Directed Energy Division and the Biosciences and Protection Division (RHP) are the primary divisions where opportunities exist for a flight surgeon to be involved with research study design. RHP is moving from legacy areas of altitude and acceleration exposures, to broader support for all warfighters through human performance research. Human performance encompasses more than just alertness, dexterity, and stamina. Overall health, acuity of the senses, and ability to handle stress are areas of preventive medicine that are also part of human performance. Characteristics such as empathy, judgment, and self-confidence are similarly relevant to human performance. Research in these areas has traditionally involved the diagnosis and management of people having difficulty coping with normal life stressors. Human performance moves beyond this to maintaining or boosting these characteristics in highly adverse situations. This may involve pharmacological interventions such as "Go" and "No-Go" pills, nutritional supplementation to enhance recovery after physical exertion, alternatives to calisthenics for improving agility, and meditation to maintain the big picture during stress. The opportunities for research are limited only by your ingenuity and commitment.

It is possible to be assigned to AFRL and never step outside of the traditional flight surgeon role. Yet, an assignment here can be so much more and offers the chance to determine the direction of aerospace medicine for decades.

